

REVISED VERSION

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
15 January 2004 (15.01.2004)

PCT

(10) International Publication Number  
**WO 2004/004837 A1**

(51) International Patent Classification<sup>7</sup>: A62C 2/06,  
E04B 1/94, E06B 5/16

(21) International Application Number:  
PCT/NO2003/000238

(22) International Filing Date: 4 July 2003 (04.07.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
20023283 5 July 2002 (05.07.2002) NO

(71) Applicant and

(72) Inventor: JENSEN, Geir [NO/NO]; Kyvannsvn. 33A,  
N-7025 Trondheim (NO).

(74) Agent: CURO AS; Box 38, N-7231 Lundamo (NO).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,

GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,  
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,  
VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

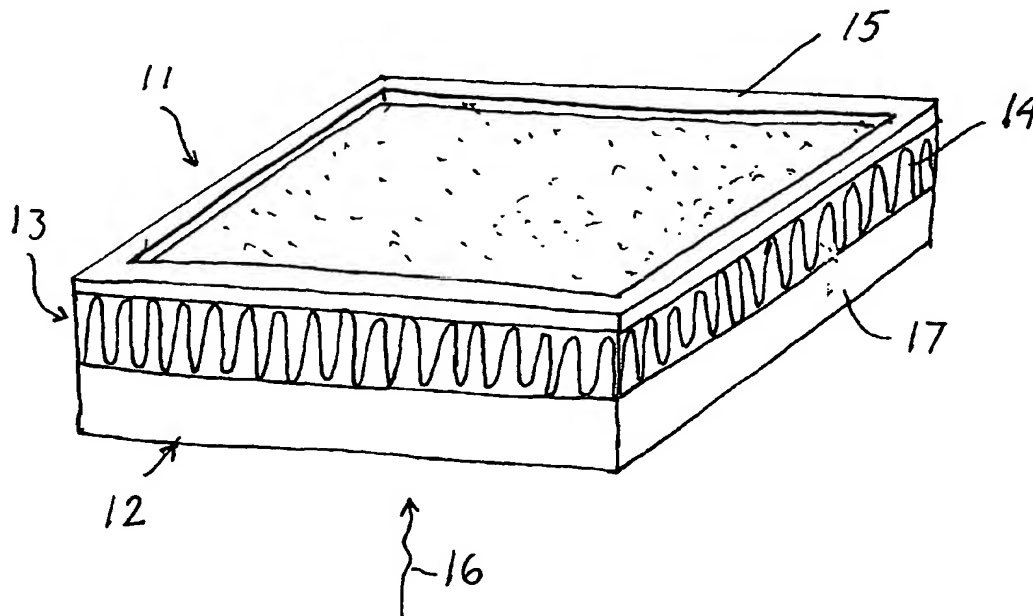
**Published:**

- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

(88) Date of publication of the revised international search  
report: 29 July 2004

[Continued on next page]

(54) Title: FIREBLOCKING DEVICE



(57) Abstract: Fireblocking device for preventing transfert of fire through ventilating apertures or similar passages, in openings for thermal fire ventilation, in ventilation ducts, in process plants or in vented facade exteriors, in vented fire blankets, vented fire protective curtans or vented protective screen against explosions. It comprises the combination of a heat absorbing and heat storing body (13), and an element (12), which includes and/or adsorbs and intumescent material.

International application No.  
**PCT/NO 03/00238**

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC7: A62C 2/06, E04B 1/94, E06B 5/16**  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

**IPC7: A62C, E04B, E06B**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**SE,DK,FI,NO classes as above**

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**WPI, PAJ, FULLTEXT, INSPEC, EPOQUE**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DK 140856 B (DUFAYLITE DEVELOPMENTS LIMITED), 26 November 1979 (26.11.79), figures 1-10, claims 1-3 --	1-8
X	US 5398467 A (SANO RICQ ET AL), 21 March 1995 (21.03.95), column 1, line 48 - column 2, line 2; column 3, line 7 - line 15; column 4, line 6 - line 9, figures 1-6 --	1-8
X	US 6572948 B1 (MICHAEL G. DYKHOFF), 3 June 2003 (03.06.03), column 1, line 65 - column 2, line 55, figures 1-5 --	1,5

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

**1 October 2003**

**06-10-2003**

Name and mailing address of the ISA/  
 Swedish Patent Office  
 Box 5055, S-102 42 STOCKHOLM  
 Facsimile No. +46 8 666 02 86

Authorized officer

**Beata Slusarczyk/Els**  
 Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 03/00238

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5811731 A (BUREAU JACQUES ET AL), 22 Sept 1998 (22.09.98), column 1, line 40 - column 2, line 20, figures 1-2  --	1,8
A	DE 19524766 A1 (HELIOS VENTILATOREN GMBH + CO.), 25 January 1996 (25.01.96), figures 1-2, claims 1-4, abstract  --	1-8
A	DE 19649126 A1 (SCHAKO METALLWARENFABRIK FERDINAND SCHAD KG - ZWEIGNIEDERLASSUNG KOLBINGEN), 28 May 1998 (28.05.98), column 1, line 38 - column 2, line 45, figures 1,4  -- -----	1-8

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

06/09/03

International application No.

PCT/NO 03/00238

Patent document cited in search report				Publication date		Patent family member(s)		Publication date	
DK	140856	B	26/11/79	DK	55176	A	12/08/77		
US	5398467	A	21/03/95	CN	1088842	A	06/07/94		
				EP	0544600	A	02/06/93		
				FR	2684306	A,B	04/06/93		
				ZA	9209267	A	30/05/94		
US	6572948	B1	03/06/03	AU	4726801	A	15/05/02		
				CA	2427224	A	10/05/02		
				EP	1330294	A	30/07/03		
				WO	0236207	A	10/05/02		
US	5811731	A	22/09/98	CA	2172445	A	24/09/96		
				DE	69608727	D,T	01/02/01		
				EP	0733384	A,B	25/09/96		
				SE	0733384	T3			
				ES	2149433	T	01/11/00		
				FR	2731913	A,B	27/09/96		
DE	19524766	A1	25/01/96	DE	9410744	U	15/09/94		
DE	19649126	A1	28/05/98	NONE					

## Fireblocking device

The invention relates to a fire blocking device as indicated in claim 1, in particular for blocking flames, which can be transferred through ventilation grates and similar apertures with  
5 air transfer. With "fireblocking device" is here ment a passive element, open for air transfer, which prevents the spreading of fire by penetration of flames, heat conduction, convection or radiation.

## Background

10 Open flame arresters are known, which function as heat sink for explosive combustion or short-lived fireballs. They are arranged open, so that air transfers, but not flames. They are often made of steel, either as perforated plates or mesh or as steel strip bodies pressed together, and similar. The function of arresting deflagration combustion first became known as Davy's net in 1815, used by Sir Humphrey Davy, and such elements have been used for different industrial  
15 purposes, such as for engine block ventilation and in gas production facilities, as explosion flame shields for personal safety offshore and similar.

Building fires are in some instances transferred by flames spreading through openings and channels containing or being adjacent to combustible elements or materials.  
20

An example of such a risk in buildings are the inlets to ventilated, non-heated roofs (voids) or attics, where flames on the outside of a wall or from a window, can spread through ventilators in eaves and into combustible structures in attics. Such areas are not easy accessible, and fires that take hold here, often result in dramatic consequences.  
25

Such fire spreading is hard to stop, and thus far one has not considered it possible to combine the demand for venting and fire resistance. Activateable dampers are considered to be too unsafe because flames can pass for minutes before closing, because of the weathering, because of mechanical and movable parts and because of dry materials, which can ignite before  
30 closing.

From US patent 5.565.274 (Perrone et al.) it is known for instance an attic hatch, which comprises intumescent material and which is closed with a heat-triggered activator.

From US patent 5.811.731 (Jacques et al.) it is known to line an intumescent material around a cable channel. There are vents for conducting excess heat from cables and a steel grille, which will be disintegrated in case of a fire.

Known patents and solutions for preventing fire spreading in openings for air passages have a weakness in that, during a period before they are activated, they allow flames to pass through and ignite combustible gas or easily ignitable solid materials on the side that shall be protected. Some of them also leave cracks, which make flame tongues and smoke spreading possible, even when they are closed.

## 10 Object

The main object of the invention is to create a passive fireblocking device for air passages, which instantly, i.e. from the first millisecond and until the openings are shut, can prevent fire from spreading via the air passage from one area with a fire, to a room, duct or other building or machine voids, where fire can cause damage and/or spread further to other and vulnerable areas with combustible materials that can spread a fire.

In particular, it is an object to create an element, which can be built into vents in buildings, such as in eaves, where air passage is required, to prevent fire from spreading through such passages or other passages, which must not spread fire.

It is also a particular object to prevent ignition of combustible gas or combustible solid material on the protected side from the very first impact of heat, conducted heat or deflagration burning from the outside, and through the entire period, the element is designed to perform.

## 25 The invention

The invention is indicated in claim 1. With "grille body" is meant any body that allows flow through a plurality of evenly distributed openings, where each opening is small compared to the total cross-section of the body.

Examples of applications of the invention are as vents in walls, bulkheads, tanks, ducts, openings for natural ventilation, in processing plants, vented facade exteriors, vented fire blankets, open fire protective curtains or open protective screen against explosions.

When used for instance in vented roofs or vulnerable eaves, the fireblocking devices according to the invention will prevent flame spreading without blocking air passage. At the same time, birds, insects, leaves and sparks are kept out. The air velocity may be reduced in regard to previous venting gaps between soffit boards, but this may be an advantage, as new  
5 research indicates that former regulations were exaggerated and thus not very energy saving.

The fireblocking devices according to the invention can be produced at low cost with cheap materials. Installation of the fireblocking device or post-installation with replacement of existing ventilating grilles, respectively, can take place without any particular training and in an easy  
10 manner. Furthermore, it is possible to make the fireblocking device according to the invention maintenance-free and nearly everlasting.

Additional advantageous features of the invention are indicated in claims 2-8. These will be described further in connection with an example of embodiment, which discloses further details  
15 of the invention.

### Example

The invention will be further described below with reference to the drawings, where  
Fig. 1 illustrates a schematic perspective view of an embodiment of the invention, and  
20 Fig. 2 correspondingly illustrates a schematic cross-section through the element in Fig. 1, in a possible application.

Fig. 1 shows a fireblocking device 11 according to the invention, which is made up of a lower, rectangular plate 12 of a grille that is treated with an intumescent material, and an upper  
25 corresponding rectangular plate 13 of a heat absorbing and heat storing material 14, through which air can flow. Over this, there is placed a rim frame 15 of a heat-insulating material, which can interrupt a heat bridge. Such a heat-insulating frame can alternatively or additionally be placed between the two plates 12 and 13.

30 This embodiment requires an upwardly directed flame in the direction 16 from below, as will be apparent from the following.

The two elements can have an arbitrary shape, depending on the field of application. They

arrangement of the two parts of the fireblocking device as indicated above, gives particular advantages because the intumescent material will be exposed to flames with maximum temperature. But it is also possible that the basic effect of the invention can be achieved in that the heat absorbing and heat storing element first and the tightening element lies behind this, in  
5 the direction of the flow.

It may also be possible to combine the two elements so that the heat sink effect and the tightening effect is obtained totally or partially by the same element.

10 The lower grille plate 12 is manufactured in a generally known manner as a perforated body of, or coated with, or treated with an intumescent material 17, i.e. a material that swells and tightens all openings when heated. This material may cover for instance 10-20 % of the flow-through area. The intumescent material can be based on high density polyethylen in hard phase of thermoplastic elastomer and chlorinated polyethylen and/or silicone rubber in soft  
15 phase. The material contains typical binding agent, thermal stabilizing material, fire retardant additive, and crust forming additives.

The lower grille plate 12 can also be manufactured as a metal grille with an intumescent material embedded in pockets or voids.

20 The upper mesh 13 can be one or more perforated plates, a honeycomb-shaped grid of steel plate, pipe metal filled with liquid, a body mainly comprised of coiled or pressed together metal threads or bands, possibly combined with small stones, steel pellets or heat conduction contact with another material that has sufficient thermal conductivity and heat storage capacity.

25 A fireblocking device according to the invention can be used in various applications. It is suitable for buildings, especially in connection with vented attics and as ventilating grilles for ducts and voids that contains combustible material, or which can transfer flames to other combustible structures. Additional fireblocking devices according to the invention can be  
30 arranged after one another in a duct or in a transition area.

Examples of applications of the invention are vents in walls, bulkheads, tanks, ducts, openings for natural ventilation, in processing plants, vented facade exteriors, vented fire



Fire blanket involves a fabric/tarpaulin/curtain in the form of a netting, where a part of the netting is heat absorbing and another part is intumescent. It can be used to extinguish car and house fires and to protect persons against fire. In this way, the blanket is light, and when it is pulled over a burning object, pressure does not increase - something which otherwise makes it impossible to use tight fire blankets - and fire does not slip through. When it becomes tight by the intumescent part and thus is affected by heat impetus, one has had the time to get it well secured in place and fastened, and the fire is smothered by its own smoke.

The safety curtains resemble fire blankets and is usually transparent, but protect persons against heat radiation from explosions or fires in the industry, in fire experiments, in laboratories or in fire demonstrations in auditoriums. Safety curtains can be used where sound, visibility, smell or pressure balancing - or all - is required, simultaneously with fire protection for persons or values.

Known techniques for protecting persons against explosions by combustion are very heavy constructions of concrete, or guiding the combustion front and the pressure wave into the open or into large volumes of air that perform as a buffer. The first technique may fail in powerful explosions, as well as being expensive and inconvenient. The latter does not provide protection against heat radiation and flaming combustion, only against the pressure impact. The present invention as a protective screen involves pressure-reducing air passages, pressure-reducing movable curtains, no passage of heat radiation and a totally gas-tight partition if the explosion is succeeded by fire. The protective screen against explosion resembles a safety curtain, but has the necessary mechanical design to withstand an explosion.

The advantages of a fireblocking device according to the invention can be summarized as follows:

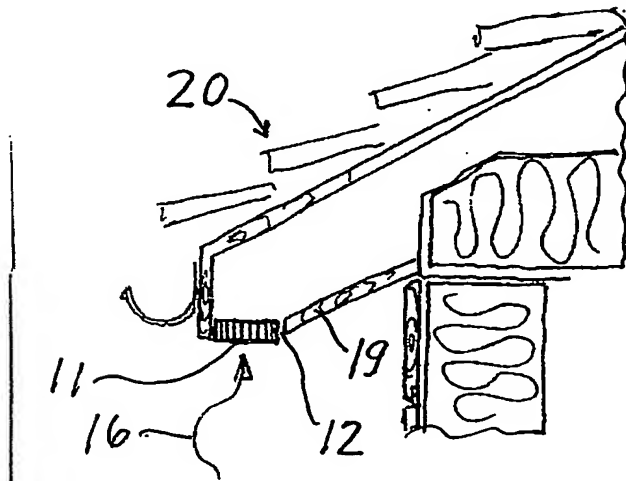
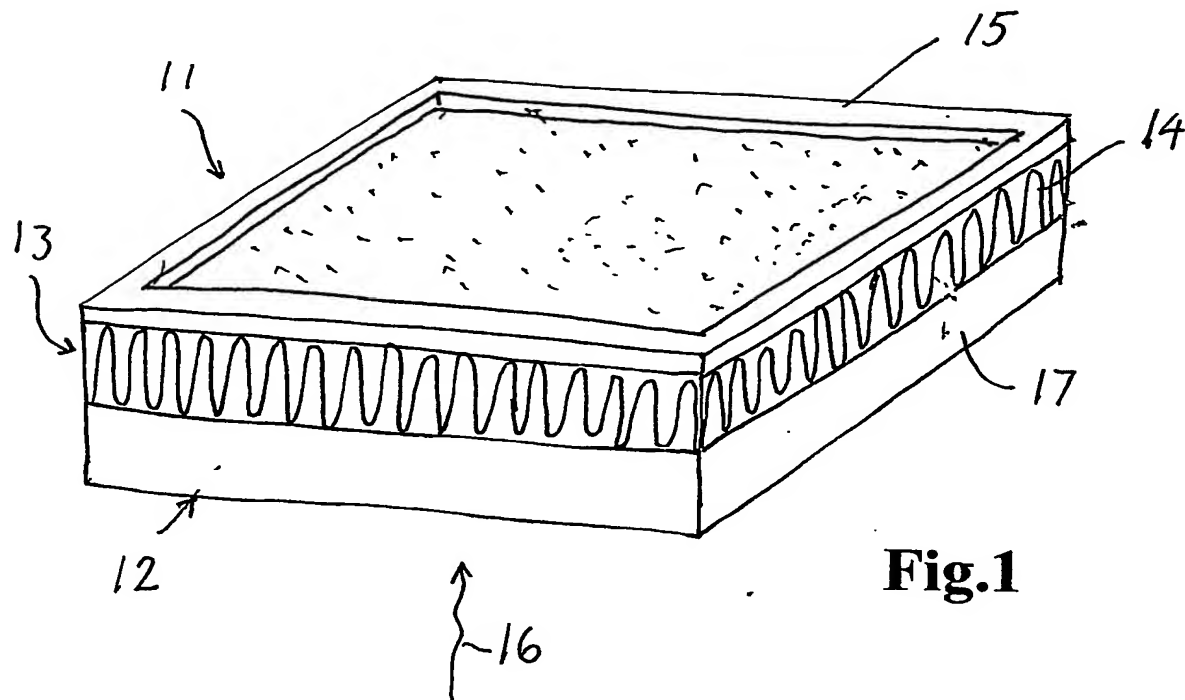
- No mechanical movable parts
- It can be installed into fire barriers, protective hoods, pipes, ducts, vented dressings, vented roofs and attics
- It prevents fire spreading by heat convection, instantaneously and during the entire fire resistance period
- It prevents fire spreading by heat radiation, instantaneously and during the entire fire resistance period

- It prevents fire spreading by heat conduction, instantaneously and during the entire fire resistance period
- It is non-combustible
- It prevents fire spreading by explosion combustion, diffuse flame combustion and fire ball
- 5 - It becomes gas tight from impact of heat from fire
- It can be cleaned by flushing
- It can be post-installed into existing constructions

Fig. 2 shows an example of a possible field of application, where a fireblocking device 12,  
10 as shown in Fig. 1, is built into the ventilating aperture 18 in a soffit at eaves 19 under a roof 20.

## Claims:

1. Fireblocking device for preventing transfer of flames fire through ventilating apertures or similar passages, in openings for thermal fire ventilation, in ventilation ducts, in process plants  
5 or in vented facade exteriors, characterized by the combination of a heat adsorbing and heat accumulating grille body (13), which is designed to stop flames in an initial phase of flame impact, and a permeable element (12), which includes and/or adsorbs an intumescent material.
2. Fireblocking device according to claim 1, characterized in that the heat absorbing and  
10 heat storing body (13) is three-dimensional.
3. Fireblocking device according to claim 2, characterized in that it is shaped as a cylinder.
- 15 4. Fireblocking device according to claim 3, characterized in that the heat absorbing and heat storing body (13) can contain metal pipes filled with liquid, minerals or mixes of these materials as main element.
5. Fireblocking device according to claim 4, characterized in that the heat absorbing and  
20 heat storing body (13) comprises honeycomb-patterned sheet-metal, which can be arranged into a frame, which includes a thermal break.
6. Fireblocking device according to one of the claims 1-5, characterized in that the heat adsorbing perforated body (13) is positioned downstream of the semi-open element (12), and  
25 which contains intumescent material, positioned towards the flame front.
7. Fireblocking device according to one of the claims 1-6, characterized in that it is provided as sheet material.
- 30 8. Use of a fireblocking device according to the invention in vents in walls, bulkheads, tanks, ducts, openings for natural ventilation, in processing plants, vented facade exteriors, vented fire blankets, vented fire protective safety curtains or vented protective screen against explosions.

**Fig.2**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 2003/000238

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A62C 2/06, E04B 1/94, E06B 5/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A62C, E04B, E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, PAJ, FULLTEXT, INSPEC, EPOQUE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DK 140856 B (DUFAYLITE DEVELOPMENTS LIMITED), 26 November 1979 (26.11.1979), figures 1-10, claims 1-3 --	1-8
X	US 5398467 A (SANO RICQ ET AL), 21 March 1995 (21.03.1995), column 1, line 48 - column 2, line 2; column 3, line 7 - line 15; column 4, line 6 - line 9, figures 1-6 --	1-8
X	WO 0236207 A1 (INNOVATIVE PROPERTIES COMPANY), 10 May 2002 (10.05.2002), & US 6572948 B1 --	1,5

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance  
"B" earlier application or patent but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 May 2004

Date of mailing of the international search report

2004-05- 28

Name and mailing address of the ISA/

Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Beata Słusarczyk/El  
Telephone No. +46 8 782 25 00

**PCT/NO 2003/000238**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
-----------	--	-----------------------

X	US 5811731 A (BUREAU JACQUES ET AL), 22 Sept 1998 (22.09.1998), column 1, line 40 - column 2, line 20, figures 1-2	1,8
	--	
A	DE 19524766 A1 (HELIOS VENTILATOREN GMBH + CO.), 25 January 1996 (25.01.1996), figures 1-2, claims 1-4, abstract	1-8
	--	
A	DE 19649126 A1 (SCHAKO METALLWARENFABRIK FERDINAND --SCHAD-KG -- ZWEIGNIEDERLASSUNG KOLBINGEN), 28 May 1998 (28.05.1998), column 1, line 38 - column 2, line 45, figures 1,4	1-8
	-- -----	

INTERNATIONAL SEARCH REPORT  
Information on patent family members

30/04/2004

International application No.

PCT/NO 2003/000238

DK	140856	B	26/11/1979	DK	55176	A	12/08/1977
US	5398467	A	21/03/1995	CN	1088842	A	06/07/1994
				EP	0544600	A	02/06/1993
				FR	2684306	A,B	04/06/1993
				ZA	9209267	A	30/05/1994
WO	0236207	A1	10/05/2002	AU	4726801	A	15/05/2002
				CA	2427224	A	10/05/2002
				CN	1471417	T	28/01/2004
				EP	1330294	A	30/07/2003
				US	6572948	B	03/06/2003
US	5811731	A	22/09/1998	CA	2172445	A	24/09/1996
				DE	69608727	D,T	01/02/2001
				EP	0733384	A,B	25/09/1996
				SE	0733384	T3	
				ES	2149433	T	01/11/2000
				FR	2731913	A,B	27/09/1996
DE	19524766	A1	25/01/1996	DE	9410744	U	15/09/1994
DE	19649126	A1	28/05/1998	NONE			